



# Middlesex University Research Repository

An open access repository of

Middlesex University research

<http://eprints.mdx.ac.uk>

Girling, William, Pujdak, Mikolaj, Dimitriou, Lygeri ORCID:  
<https://orcid.org/0000-0002-5093-558X>, van Wyk, Aléchia ORCID:  
<https://orcid.org/0000-0001-6823-088X>, Vidal, Marina, Peterca, Jost, Curtis, Christopher  
ORCID: <https://orcid.org/0000-0002-4386-0284> and Paice, Katherine (2019) The effect of  
carbohydrate dose and timing on timed effort and time to exhaustion within a simulated cycle  
race in male professional cyclists. Journal of Sports Sciences, Volume 37, 2019 - Issue sup1:  
BASES Conference 2019 — Programme and Abstracts. In: British Association of Sport  
Exercise Sciences: BASES Conference 2019, 19 - 20 Nov 2019, Leicester, UK. . ISSN  
0264-0414 [Conference or Workshop Item] (doi:10.1080/02640414.2019.1671688)

Final accepted version (with author's formatting)

This version is available at: <http://eprints.mdx.ac.uk/28080/>

## Copyright:

Middlesex University Research Repository makes the University's research available electronically.

Copyright and moral rights to this work are retained by the author and/or other copyright owners unless otherwise stated. The work is supplied on the understanding that any use for commercial gain is strictly forbidden. A copy may be downloaded for personal, non-commercial, research or study without prior permission and without charge.

Works, including theses and research projects, may not be reproduced in any format or medium, or extensive quotations taken from them, or their content changed in any way, without first obtaining permission in writing from the copyright holder(s). They may not be sold or exploited commercially in any format or medium without the prior written permission of the copyright holder(s).

Full bibliographic details must be given when referring to, or quoting from full items including the author's name, the title of the work, publication details where relevant (place, publisher, date), pagination, and for theses or dissertations the awarding institution, the degree type awarded, and the date of the award.

If you believe that any material held in the repository infringes copyright law, please contact the Repository Team at Middlesex University via the following email address:

[eprints@mdx.ac.uk](mailto:eprints@mdx.ac.uk)

The item will be removed from the repository while any claim is being investigated.

See also repository copyright: re-use policy: <http://eprints.mdx.ac.uk/policies.html#copy>

## **The effect of carbohydrate dose and timing on timed effort and time to exhaustion within a simulated cycle race in male professional cyclists**

WILLIAM GIRLING<sup>1</sup>, MIKOLAJ PUJDAK<sup>1</sup>, LYGERI DIMITRIOU<sup>2</sup>, ALECHIA VAN WYK<sup>2</sup>, MARINA VIDAL<sup>1</sup>, JOST PETERCA<sup>1</sup>, CHRISTOPHER CURTIS<sup>1</sup> & KATHERINE PAICE<sup>1</sup>

<sup>1</sup> London Sport Institute, Middlesex University (Middlesex, UK)

<sup>2</sup> Natural Sciences, Middlesex University (Middlesex, UK)

\*Corresponding author: Kat Paice ([k.paice@mdx.ac.uk](mailto:k.paice@mdx.ac.uk)); @kat\_paice

A key performance limitation affecting professional endurance cycling is carbohydrate storage and utilisation (Pöschmüller, Schwingshack, Colombani & Hoffmann, 2016, *Journal of the International Society of Sports Nutrition*, 13). Muscle glycogen stores alone are inefficient at maintaining optimal blood glucose levels beyond two hours of exercise; consequently, exogenous CHO is commonly used to counteract this (Jeukendrup, 2011, *Journal of Sports Sciences*, 21, 91-99). High concentrations of CHO can cause drops in blood glucose, excessive glycogen utilisation and gastrointestinal discomfort (GID) (Jeukendrup, 2011). Therefore, the aim of this study was to determine if frequent, smaller CHO feedings would be preferable to large, bolus CHO feedings on time trial cycling performance. With institutional ethics approval, 5 professional cyclists completed a 4h simulated cycle ride with 3 timed efforts in a randomised, cross-over, double blind design study. Each timed effort occurred in the last 10 min of each hour (TE1, TE2, TE3); participants were asked to cycle with maximum effort for this time. There was also a final effort at the end of the 4<sup>th</sup> hour to replicate a sprint finish. This was measured as time to exhaustion (TTE). Two interventions were used; a frequent feed (F) where participants drank 20g maltodextrin in 300ml flavoured water solution 3 times per hour and a bolus feed (B) where participants drank 60g maltodextrin solution once per hour. Heart rate, power output, GID, perceived exertion (RPE), blood lactate and blood glucose were recorded before and after TE1, TE2, TE3 and TTE. Wilcoxon signed rank test and Cohen's D was performed to study differences between interventions and effect sizes. In the F intervention, average watts were significantly higher at TE2 ( $P < 0.05$   $d = 0.75$ ) and TE3 ( $P < 0.05$   $d = 1.21$ ) and the RPE was lower TE1 ( $P \geq 0.05$   $d = 1.12$ ), TE2 ( $P < 0.05$ ,  $d = 1.12$ ) and TTE ( $P \geq 0.05$   $d = 1.12$ ) compared to B. There was no significant difference between any other variables. The results suggest that despite power output being higher, RPE was lower in the F intervention. Gut absorption of CHO is limited to 1g/h (Jeukendrup, 2011), which may help explain these findings. This is one of the first studies to look at concentration and timing of CHO consumption in endurance cycling. Regular feeds of 20g CHO may be more beneficial on power output and RPE in endurance cycling compared to hourly 60g feeds.